

**Notice of Allowability**

Application No.

10/009,772

Examiner

Albert T. Chou

Applicant(s)

KIM, KWANG-CHUL

Art Unit

2662

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to January 5, 2006.
2. ☒ The allowed claim(s) is/are 1-14.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some\* c) ☐ None of the:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

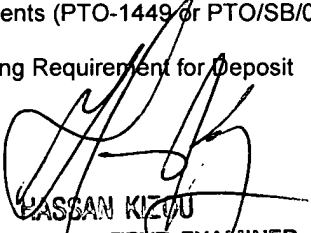
Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
- (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☒ Other 3 sheets of corrected drawings (Figs 1A, 1B and 3)

  
HASSAN KIZIL  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2600

## **DETAILED ACTION**

### **EXAMINER'S AMENDMENT**

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Peter McKenna (Reg. No. 38551) on January 9<sup>th</sup>, 2006.

The application has been amended as follows:

- Figs. 1A and 1B have been labeled as "PRIOR ART".
- Fig 3, step 306, has been amended to "NORMALIZE AUTOCORRELATED VALUE".

The above amendments are shown in the attached sheets.

### ***Allowable Subject Matter***

2. Claims 1-14 are allowed.

### ***Reasons for Allowance***

3. The following is an examiner's statement of reasons for allowance: Applicants have claimed the following uniquely distinct features in the instant invention, which are not found in the prior art, either singularly or in combination:

- A frequency and symbol timing synchronization apparatus for achieving frequency synchronization and symbol timing synchronization of an orthogonal frequency division multiplexed (OFDM) signal, the apparatus comprising:  
an autocorrelation unit for receiving data; a comparator for comparing the normalized autocorrelated value with a predetermined threshold value; a peak flat detector for detecting as a flat section a section; a frequency offset estimator for estimating a frequency offset within the flat section to obtain a frequency offset value; a frequency offset compensation unit for compensating for the frequency offset of a received signal using the frequency offset value; a cross correlation unit for performing cross correlation using a frequency offset-compensated signal and a reference signal, and normalizing the cross-correlated value to output a normalized cross-correlated value; and a symbol timing synchronization unit for detecting a point where the cross-correlated value is maximum, and performing symbol timing estimation, thereby performing symbol timing synchronization.
- A frequency and symbol timing synchronization method for achieving frequency synchronization and symbol timing synchronization of an orthogonal frequency division multiplexed (OFDM) signal, the method comprising:  
(a) organizing a synchronizing symbol with at least three identical synchronous signals;

- (b) receiving a signal including the synchronizing symbol, delaying the received signal by a predetermined delay amount, performing autocorrelation between the received signal and the delayed signal, normalizing an autocorrelated value, and detecting as a flat section a section where the normalized autocorrelated value is greater than a predetermined threshold value;
- (c) estimating a frequency offset within the flat section to obtain a frequency offset value;
- (d) compensating for the frequency offset of the received signal using the frequency offset value;
- (e) performing symbol timing synchronization using a frequency offset-compensated signal and a reference signal.

The closest prior art, either singularly or in combination, fails to anticipate or render the above limitations obvious.

### ***Conclusion***

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- US Patent No. 5,444,697 to Leung et al. disclose "Method And Apparatus for Frame Synchronization in Mobile OFDM Data Communication"
- US Patent No. 5,732,113 to Schmidl et al. disclose "Timing And Frequency Synchronization of OFDM Signals"

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- US Patent No. 5,991,289 to Huang et al. disclose "Synchronization Method And Apparatus for Guard Interval-Based OFDM Signals"
- US Patent No. 6,539,063 to Peyla et al. disclose "System And Method for Recovering Symbol Timing Offset And Carrier Frequency Error in An OFDM Digital Audio Broadcast System"
- US Patent No. 6,314,083 to Kishimoto et al. disclose "Frequency Control Device And Method for Frequency Synchronization With Multiplex Signal by OFDM, Receiving Device, And Communication Device"
- US Patent No. 6,731,594 to Bohnke discloses "Transmission System for OFDM-Signals With Optimized Synchronization"
- US Patent No. 6,421,401 to Palin discloses "Method And Apparatus for Achieving And Maintaining Symbol Synchronization Particular in An OFDM System"

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Albert T. Chou whose telephone number is 571-272-6045. The examiner can normally be reached on 8:30 - 17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Kizou can be reached on 571-272-3088. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

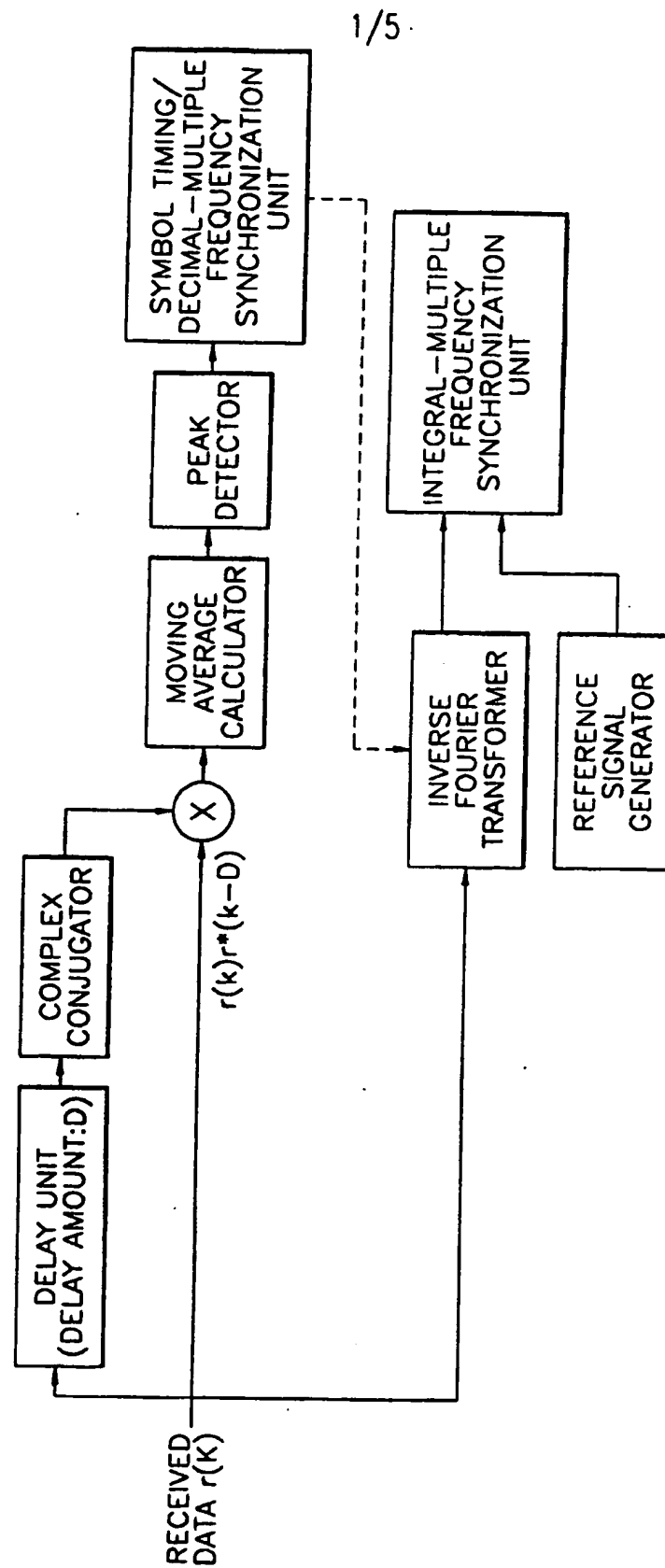
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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Albert T. Chou  
January 9, 2006

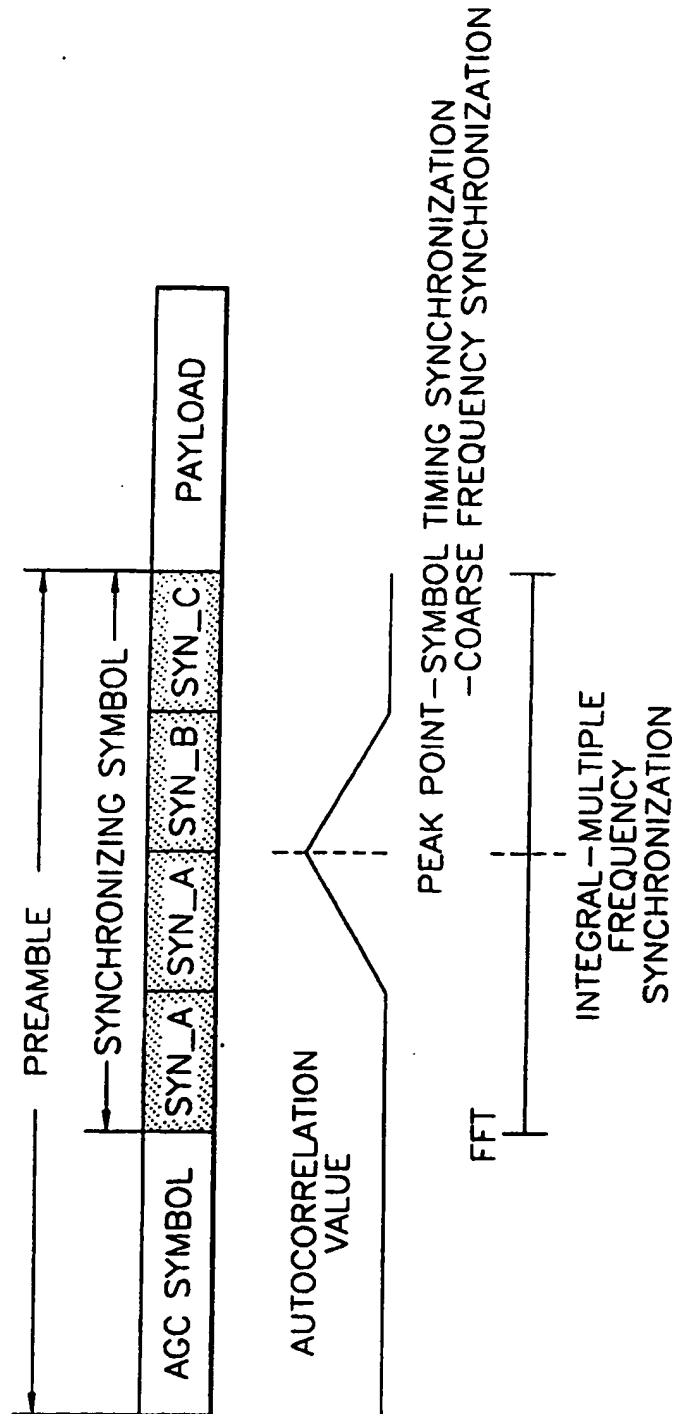
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FIG. 1A (PRIOR ART)



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**FIG. 1B (PRIOR ART)**





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FIG. 3

